Silage

IN SASKATCHEWAN

SASKATCHEWAN DEPARTMENT OF AGRICULTURE

Published under the

SASKATCHEWAN CO-OPERATIVE AGRICULTURAL EXTENSION PROGRAM

By authority of
Hon. A. H. McDonald, Minister of Agriculture

Cover Photo by A. W. Sereda

Freshly cut swath of forage is picked up, chopped and blown into a truck by the forage harvester.

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ADVANTAGES OF SILAGE

1. Top quality feed can be put up with little regard for the weather.
2. The total nutrient harvested per acre is greatest with silage because field loss of nutrients (leaf shattering and/or weathering) is reduced to a minimum.
3. Feed reserves can be stored for many years without any significant loss of nutrients.
4. A wider variety of crops can be used for forage permitting more intensive land use.
5. Hailed, frozen and weedy crops can be salvaged for feed.
6. The harvesting operation is highly mechanized and is an efficient and economical method of harvesting forage.
7. Silage lends itself to automated feeding.
8. Hazards of bloat are reduced.

INTRODUCTION

Silage offers an effective method of harvesting and preserving forage. This method makes it possible to put up top quality feed with little regard for the weather and to carry feed reserves with very little loss through spoilage. A wide variety of crops, including weedy stands, may be used for silage.

Silage making can be highly mechanized. Neighborhood farmers can pool labour and machinery to increase the efficiency of the operation. These advantages, along with improved livestock nutrition, offer stability to the livestock industry and increased prosperity to the producer.

The purpose of this bulletin is to present the advantages that silage has to offer to a livestock producer and to describe the techniques of ensiling that need to be followed to produce high quality feed.

SILAGE FERMENTATION

Plant cells in their normal life processes breathe, taking on oxygen and giving off carbon dioxide and water. When freshly cut forage is placed in the silo, this breathing process continues for several hours. Since silage is tightly packed and very little air is available, breathing stops when the air around the plants is used up. During the first 12 hours, the silage temperature should rise to 115 - 120°F. Temperatures, after 24 hours, should drop to about 100°F. and keep on dropping until after 20 days it is about 80°F. If too much air has been left in the silage, because of not enough packing, overheating will likely occur. This happens most often with overmature crops which are difficult to pack. If the silage does not heat enough or remains cold, this is caused by a lack of air due to too much packing or too much moisture or both. This stops the breathing process too soon and it delays or changes the whole process. This is seldom a problem in Saskatchewan and is likely to occur only in very green succulent legume crops.

SILOS

Two basic types of silos are used in Saskatchewan; the upright or tower silo and the horizontal silo which may be a trench or an above ground bunker.

TYPES OF SILOS

1. Upright

Upright silos are very expensive and, therefore, are not popular in Saskatchewan. They are useful in large, specialized, automated

feeding operations. Freezing around the outside is a problem but with automatic unloading equipment it is not serious.

2. **Horizontal**

(a) *Trench*—Trench silos are popular where they can be cut into the side of a hill or a creek bank. However, a 3 or 4 foot rise can provide a good location for a trench silo by using the excavated soil to build up the sides. Soil from dugout excavation can be used to make silos on level ground. In sandy soils, the walls of a trench silo may be lined with concrete or pressure-treated lumber to prevent them from caving in.

Photo by A. W. Sereda

A good trench silo constructed by cutting down a 3 or 4 foot rise and using excavated soil to build the sides.

(b) *Bunker*—A bunker silo consists of two tight walls of pressure-treated wood or concrete set above ground on a 1 : 8 slope and well braced and anchored. The walls should be banked with dirt or straw bales to prevent freezing of silage. Emergency, temporary bunkers can be made from straw bales reinforced with page wire and poles

and lined with polyethylene. Because bunkers are generally more expensive or less permanent than trench silos, the possibilities for a trench silo should be explored first. (Figure 1 provides basic details for bunker silo construction. More detailed plans are available from the Canadian Farm Building Plan Service through your Agricultural Representative office and from your lumber and cement dealers.)

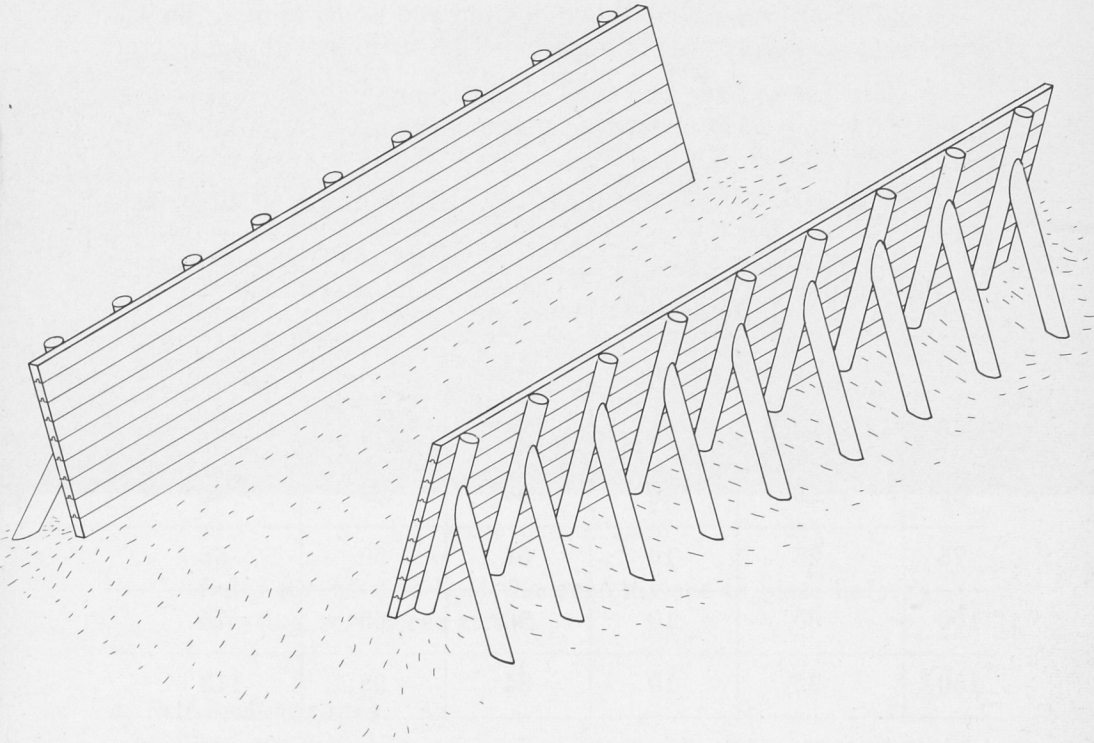

FIGURE 1—A BUNKER SILO

HORIZONTAL SILO CONSTRUCTION

1. Site

Select a **well-drained** site, handy to the feeding area. The site should be well sheltered to avoid problems with snowdrifts. Snowfencing can be used as a windbreak, but trees offer better protection. The silo must be fenced to keep livestock out. Both the site and the silo require drainage with a minimum slope to the silo floor of one foot fall per hundred feet of length.

2. Size and Shape

Approximately one cubic foot of silage per animal per day is required for wintering cattle (Table 1). The trench silo should be constructed as deep as practical to keep the exposed surface area as small as possible. A small surface on top reduces spoilage losses and the cost of covering with polyethylene. Depths of 10 - 15 feet are common. The width of the silo will vary with the size of the herd and how they are fed. If silage is fed by hand, widths of 18-22 feet are suggested. Where a front end loader is used, the silo needs to be 25 feet wide or more to permit turning with the tractor.

It is better to have two smaller silos than one large one — then the silo with a carry-over of old silage can be fed first.

TABLE 1—SUGGESTED HORIZONTAL SILO SIZES*

No. of Cows	Average Width in Feet	Average Depth in Feet	Required Length of Silo (in feet) for:		
			150 days feeding	175 days feeding	200 days feeding
25	20	8	35	41	47
40	20	8	56	66	75
50	25	10	34	39	45
75	25	10	51	59	68
100	30	10	56	66	75
150	30	10	84	98	113

*Calculated on the basis of silage at 40 lbs. per cubic foot (65% moisture) and a daily ration of 45 lbs. of silage per cow per day.

3. Covers

A silo must be properly covered IMMEDIATELY AFTER IT IS FILLED to keep out air and rain, or large quantities of feed will be lost by spoilage. Silo covers (polyethylene sheeting) are available in a wide variety of sizes and are cheap compared to the value of feed that is usually lost when the silo is not covered. The 4 mil thickness is suggested. It is not practical to save a sheet to use again as a silo cover, but usually pieces of a sheet can be saved for other uses on the farm. Keep the sheeting away from cattle because some have died from eating it.

Photo by H. N. Lang

Bales are used to hold the polyethylene in place before covering with loose straw.

4. Self-feeding Gates

When self-feeding from a horizontal silo, movable self-feeding gates should be used and a concrete floor is necessary. Detailed plans are available from the Canadian Farm Building Plan Service.

5. Other

It is desirable to have a ramp 25 - 50 feet wide alongside or at the end of the silo where silage can be unloaded and then pushed into the silo with a front end loader. By not having to drive through the silo to unload, the operation is speeded up and the wear and tear on equipment is reduced.

Removable bulkheads (wooden partitions) at the ends of the silo can be used to reduce spoilage and the cost of covering.

EQUIPMENT FOR SILAGE MAKING

FORAGE HARVESTERS

1. Features

In selecting a forage harvester, the following features should be taken into consideration:

(a) *Capacity* — The machine should be matched to the over-all operation and the tractor.

(b) *Adjustment for length of cut* — The length of cut of the material is important in making and handling good silage. The machine should provide a clean cut, with enough control of length to chop material to ½ to ¾ inches in length.

(c) *Efficient pickup and feeding mechanism* — Wide pickups permit good feeding and clean picking up of heavy windrows. Narrow pick-ups may have heavy pickup losses before the machine is fully loaded.

(d) *Adjustable spout with handy controls* — Delivery spouts should swing to either side as well as to the rear. Their height, reach and adjustment should be considered in relation to the trucks or wagons being used. Low spouts frequently dribble some forage over the edge of the box on rough ground. Where the forage has been windrowed, it is an advantage to be able to drive the truck on the side of the windrow opposite the tractor. This enables easier loading and gives both the tractor and truck driver a clear view of the operation.

(e) *Provision for sharpening knives* — Cylinder cutterhead machines have a mounted sharpening stone which enables the operator to do a good and frequent job of sharpening the knives in the field.

2. Types

Three types of forage harvesters are in common use: the flail type, radial knife cutterhead and cylinder cutterhead.

Flail machines are the simplest and least expensive. They can harvest either a standing or windrowed crop but have the disadvantage of giving less control over the length of cut and their power requirements are highest per ton harvested. In loose dry soils, some soil particles can be sucked up and mixed with the forage, lowering its palatability.

Radial knife cutterhead machines are satisfactory, however, considerable maintenance is required. The trend in forage harvesters appears to be towards cylinder cutterhead machines. Their construction is simpler than the radial knife machines and control of the length of cut is as good. Length of cut is controlled by adjusting the

speed of the feed rolls in relation to the speed of the cutterhead, by adding or removing knives on the cutterhead or by a combination of both. On some cylinder cutterhead machines the feeding mechanism is reversible. This assists in cleaning out the machine when plugging occurs.

Both radial knife and cylinder cutterhead machines may be purchased with either cutter bar or pickup. Harvestng can be speeded up by swathing. Swathing also allows for wilting when necessary.

HAULING AND UNLOADING EQUIPMENT

Trucks with hydraulic hoists are excellent for hauling and dumping silage. A special end-gate hinged at the top and the full width of the box should be installed to permit easy dumping. Various types of wagons and forage boxes are also available. For speed and convenience it is important that wagon boxes be mechanically unloaded. Some commercial models are equipped with power-driven slat-type conveyors.

A forage box which works well has the bottom sloped to the sides and the side panels of the box hinged at the top. To unload the side panels release at the bottom and the silage slides out.

Photo by J. A. Peck

A side unloading wagon is a quick way of dumping cut forage.

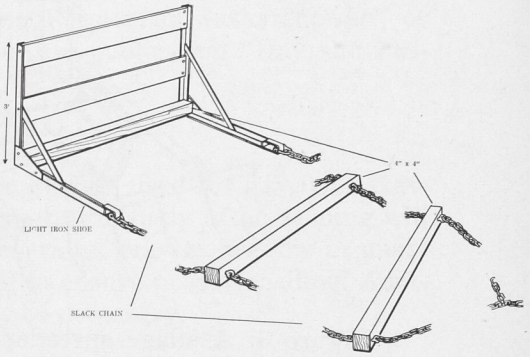

Figure 2 — A false front and bars connected by chains unload the forage box.

Another device consists of a false front and bars such as 4 x 4's laid cross ways on the floor and loosely connected near their ends by lengths of chain (Figure 2). To unload, a cable is fastened to the chains connecting the 4 x 4 bars and as the wagon is pulled forward the bars drag the forage out of the box. The chains should be slack between the individual bars to assist in unloading and spreading the forage as it is pulled out of the box.

Cut forage unloads easier if the front of the box is 4 - 6 inches narrower than the rear. In some crops and in windy weather the truck or wagon box should have a protective screen, so leafy material will not be blown away.

PACKING AND SPREADING EQUIPMENT

Tractors are used for packing in horizontal silos and should be equipped to spread the silage at the same time. Stiff-tooth cultavator shanks, spaced 18 inches apart and welded to a heavy cross bar, make a good spreader attachment for a front end loader. The silage should trickle through the teeth and be spread evenly. A spreader attachment should not be wider than the width of the tractor to permit packing along the edges of the silo.

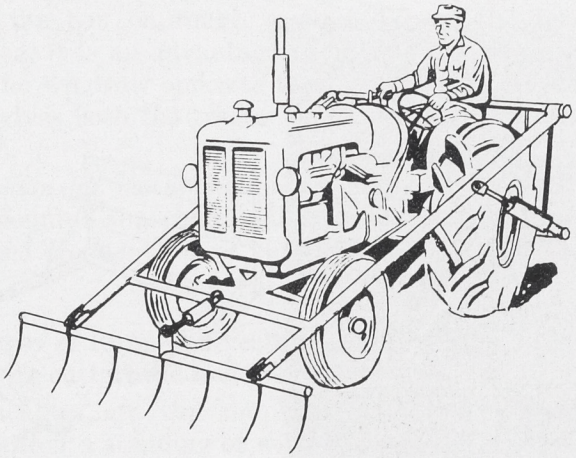

Figure 3. A silage spreader aids in spreading and packing the silage in the pit.

CROPS FOR SILAGE

Select crops for silage on the basis of feed value, yield and usefulness in the crop rotation. Any green crop can be made into silage, but poor forage will not make high quality feed. Ensiling may improve palatability.

Field losses, such as leaf shattering and weathering, are small when making silage. Fermentation improves palatability. Some crops will make better silage than hay. Sweet Clover is an example.

A wide variety of crops can be used for high quality feed by ensiling. This provides for crop rotations and better land use.

LEGUMES

Alfalfa, other clovers and peas make excellent silage. Sweet Clover outyields most other crops and produces high quality feed when made into silage. It also fits into a short-term, soil improving crop rotation. There is no danger from Sweet Clover poisoning if proper ensiling methods are followed and if the silo is covered and well sealed to avoid spoilage. Spoiled or mouldy Sweet Clover silage should not be fed.

Legumes should be cut at the early bloom stage. At this stage, their moisture content is often too high for making good silage and it may be necessary to windrow and wilt the crop to reduce the moisture content to the desired level. (See section on preservatives.)

GRASS-LEGUME MIXTURES

Grass-legume mixtures are ideal silage crops. They offer a better balanced feed than either legumes or grasses alone. Legumes and grass-legume mixtures are also valuable soil improvement crops.

Harvest grass-legume mixtures when the legume is in the one-tenth to half-bloom stage. For recommended mixtures, see the Forage Crops Section of the "Guide to Farm Practice in Saskatchewan" or Saskatchewan Department of Agriculture publication "Hay and Pasture Crops for Saskatchewan."

GRASSES

Any of the cultivated and native grasses used for hay in Saskatchewan can be put up as silage. Harvesting shortly after heading will provide the highest quality feed. Generally, grasses are low in moisture and early harvesting is essential to ensure proper ensiling. Additional packing and finer chopping may be necessary.

CEREAL CROPS

Cereal crops are often used for silage because of their high yield, ease of handling and their adaptation to a short-term, intensive, versatile cropping program. Cereal crops for silage require a short growing season. This allows time for partial summerfallowing to control weeds and conserve moisture. This permits a continuous cropping program in many areas.

Mixtures of cereals are preferred to single grains for silage. There is a wide variety of possible combinations. A popular mixture of grains consists of oats, Husky barley and Gateway barley. This mixture provides a good balance between energy level and protein content since Gateway is more advanced when the other grains are at the proper stage for ensiling. The seed mixture should contain at least 70% oats.

Mixtures of oats and barley, oats and peas, and Fall rye and sweet clover may be grown for silage. Fall rye may be used alone as a silage crop or in mixtures to provide an aftermath for late fall and early spring grazing on the silage crop stubble.

Cereals for silage may be seeded on stubble or summerfallow. On stubble, the crop is generally seeded very early in the spring, harvested in June or early July and the field is summerfallowed for the balance of the year. Another alternative is to summerfallow early and delay seeding until late June in anticipation of "June rains" and the hot growing weather that follows.

In normal years, cereals should be harvested for silage in the early dough stage, but in dry years earlier harvesting to ensure adequate moisture content may be necessary.

Photo by H. N. Lang

A cereal crop can produce eight to ten tons of silage per acre.

CORN

Corn is a good crop for silage but is not presently recommended in Saskatchewan. It does not yield as well as sweet clover or cereals. The growing season is too short, temperatures are not warm enough

and our average rainfall is too low for maximum yields. Special equipment for cultivating and harvesting may also be needed.

SALVAGE CROPS

It is often possible to salvage crops for feed by making them into silage. Weedy growth on new grass stands, weedy crops, hailed, frozen and rusted crops can be made into silage with less loss than hay and palatability is improved.

TABLE 2 — STAGE OF GROWTH FOR HARVESTING

CROP	APPROX. STAGE OF GROWTH FOR HARVESTING	REMARKS
Sweet Clover	Early Flowering	Biennial—very high yielder May require wilting to reduce moisture
Alfalfa	Early Flowering	Perennial—high yielder May require wilting
Red Clover	Early Flowering	Usually behaves like a biennial May require wilting
Field peas	Early Podding	Annual—good yield Used in mixtures
Perennial grasses	Heading to early heads	Perennial—good yielder
Cereals	Early dough stage	Annual—high yield

HARVESTING AND ENSILING

Good silage depends on harvesting the crop at the proper moisture content and the exclusion of air.

The desirable moisture content is 60-68%. Forage which is too wet will have high seepage losses. Another danger of ensiling at high moisture is the formation of strong-smelling, undesirable butyric acid instead of the characteristic lactic acid. Some crops, at their ideal

harvesting stage, contain excessive moisture. In such cases, swath and wilt to the desired moisture content before chopping and ensiling. If damp weather conditions interfere with wilting, the alternative is a longer cut or less packing or both.

A rough guide to the moisture content is the hand squeeze test. A handful of silage squeezed into a ball should expand slowly when released. If liquid can be squeezed out or if a compact ball remains, the silage is too wet. Alternatively, if too dry, the ball of silage will quickly spring apart. This method has little value when considerable coarse stemmy material is present. For people unfamiliar with silage making, it is desirable to have several silage samples tested with an oil moisture tester (sometimes used by elevator agents) to establish a guide for judging moisture content in the field.

The length of cut is one factor which determines the amount of packing necessary for air exclusion. Forage below 60% moisture content is difficult to pack and should be chopped as short as possible (½ - ¾ inches long). Green succulent forage on the other hand, packs more readily and the length of cut can be increased to 1 - 2 inches. Long cut silage (4 - 6 inches) may be difficult to dig out of the silo.

Photo by A. W. Sereda

The majority of the crop should be cut ½ - ¾ inches long for ease in packing and handling.

PACKING

Packing is extremely important. While it is possible to over-pack, in most cases more packing would be beneficial. A good guide to the amount of packing needed, is the temperature of the silage. Silage which has been in the silo for several hours should feel warm (100 - 120°F.). Use a probe thermometer. If the silage later turns a brownish color, the temperature has been too high during the fermentation process; probably a result of insufficient packing. Thorough packing when the silo is filled is essential.

Photo by L. Koturbash

Spreading and packing is an important operation.

FILLING

Trench silos may be filled by dumping over the side, driving through or dumping the load at the silo entrance and pushing the silage in with a front-end loader. Those who drive over silage may get stuck occasionally. However, this should not be a problem if continuous spreading and packing are carried on. With bunker silos it is necessary to drive over the silage or to dump at the entrance and push the silage up.

Steady progress in filling the silo prevents spoilage due to exposure to air. Fill the silo at one end and work gradually toward the other to keep exposed silage to a minimum.

When there is going to be a delay in filling the silo because a portion of the silage crop is not ready, the silage should be covered with polyethylene. When harvesting resumes, whether covered or not, any spoiled silage should be removed before fresh silage is placed in the silo. The same procedure should be followed when a new crop is being added to a silo which contains carry-over from a previous year.

A filled silo should have the silage crowned up 2 - 3 feet above the walls to provide for good runoff after settling. The filled silo **must be covered immediately** with polyethylene and thoroughly sealed down at the edges with dirt or straw bales. In this way most of the air is used up in about five hours compared to ninety hours after sealing if the silage is left uncovered for two days. Cover the entire silo with straw bales, loose hay or straw to protect the polyethylene from damage by hail, wind or poultry, and to reduce freezing at the surface.

Photo by H. N. Lang

Hydraulic dump trucks and trench silo are a big advantage.

PRESERVATIVES

Quality silage can be made without the addition of preservatives if proper ensiling methods are followed. Preservatives are an added cost, extra labour and equipment are needed to get them mixed with the silage, and ensiling operation is slowed down. **Preservatives do not guarantee good silage.**

Good silage is made by ensiling crops at their recommended stage or maturity and moisture content. When ensiling pure legumes it may be difficult to get the moisture content down to the desired level. Two hundred pounds of ground grain (preferably barley) per ton of silage, added as a preservative will reduce the moisture content by 5%. Sodium metabisulphate may also be added as a preservative at 8 pounds per ton of silage.

TABLE 3 — A SILAGE QUALITY GUIDE

Condition	Color	Odor
DESIRABLE	Natural forage green or slightly yellowish-green; light to dark green depending on crop; red clover may have a darker color.	Clean; pleasant; no indication of putrefaction.
ACCEPTABLE	Deep dark green; very yellowish-green; slight brownish-green.	Somewhat strong; yeasty, fruity or musty; slightly burned odor, sweet.
UNDESIRABLE	1) Brown or black indicating excessive heating or putrefaction.	a) Strong (ammonia) indicating too high a moisture content. b) Burned or caramelized indicating excessive heat. c) Sliminess and a putrid odor indicating improper fermentation, spoilage.
	2) Predominantly white or gray indicating excessive mould.	a) Very musty or mouldy.

CREW ORGANIZATION

The crew and equipment must be carefully organized for efficient ensiling operations. While the labour requirements per ton of feed harvested are low for silage compared to other methods of harvesting forage, the size of crew required for an efficient operation is quite large. However, several farmers can pool their labour and equipment and make maximum use of the forage harvester. For example, a good crew is composed of one swather operator, one forage harvester operator, two truck drivers (three if hauling distance is long) and one to two tractor operators at the silo levelling and packing. A crew of this size will harvest 20 - 30 tons of silage per hour and ensile sufficient feed in 2 to 3 days to winter 100 head of cattle. Further information on setting up a syndicate or a co-operative is available from the Farm Management Division, Saskatchewan Department of Agriculture, Administration Building, Regina.

In a medium sized operation, trucks or forage wagons and a tractor can be used to haul silage. Four or five men are required for this crew. This provides one man and tractor handling two wagons or two truck drivers, one man at the silo and one man and tractor on the forage harvester. In general, the smaller the crew, the slower the rate of ensiling and the higher the cost per ton.

Where labour is scarce, a silage operation can be handled by two men. One man operates the forage harvester and hauls to the silo while the other is spreading and packing. Because ensiling is slower and more drying takes place, it should be harvested at a higher moisture content. If a two-man crew is used, the crop is usually cut and chopped in one operation.

TABLE 4 — A GUIDE TO LABOUR AND MACHINERY REQUIREMENTS FOR HARVESTING SILAGE

		Size of Operation	
	Large	**Medium**	**Small**
Crew	Five to six	Four to five	Two
Forage Harvester	High capacity—equipped with pick-up.	Medium capacity —equipped with pick-up.	Medium to small —equipped with cutter bar or flail type.
Swather	15' or larger	One—any size	Not required.
Tractors	Two to three	Two to three	Two
Trucks	Two to three—with hydraulic dumps.	Two trucks or two wagons	Not required.
Forage Wagons	Not required	— —	One
Capacity	20-30 tons per operating hour.	10-15 tons per operating hour	2-8 tons per operating hour

SILAGE LOSSES

Losses may result from (1) seepage; (2) spoilage; (3) fermentation and oxidation.

In most silage making, some liquid drains down through the silage and out of the silo, carrying plant nutrients with it. Seepage losses can be high if the crop has a high moisture content (over 68%).

Spoilage losses occur where the silage is exposed. These losses are largely preventable by adequate covers and packing to exclude the air. Air pockets within the silo, particularly along the walls can be avoided by careful spreading and packing. Plastic covers for horizontal silos will greatly reduce spoilage. Losses from spoilage are usually greater than apparent. For example, 6 inches of observed spoilage may represent the decomposed residue of 12 - 18 inches of silage.

Fermentation and oxidation losses go unnoticed. The seriousness of these losses corresponds to the increase of temperature within the silage. In some cases when the temperature has risen to a very high level, some of the forage may appear burned or charred — something like burned sugar. This condition is referred to as caramelization. When this occurs, a considerable amount of the feed value originally in the material will have been destroyed or lost in the form of gas. This type of loss is best prevented by proper silage making methods.

FEEDING SILAGE

The feed value of silage depends on the crop ensiled and will vary from year to year. Feed analysis is necessary for formulating balanced rations. Silage reserves can be carried with little, if any, loss of nutrients in storage. This adds security and stability to the livestock enterprise.

NUTRITIONAL ADVANTAGES OF SILAGE

Silage preserves 85% or more of the plant nutrients compared to 50% - 80% for hay.

Higher protein and vitamin A content in silage reduces or eliminates the cost required to add protein and vitamin supplements to a ration.

Bloat is greatly reduced.

Silage improves palatability of many crops, particularly coarse or stemmy crops such as sweet clover, since the entire plant is relished and waste is reduced.

Silage is slightly laxative.

Silage can be kept for many years with very little loss of feed value.

NUTRITIONAL DISADVANTAGES OF SILAGE

Silage contains less vitamin D than good sun-cured hay. However, beef cattle usually receive sufficient vitamin D from exposure to direct sunlight or from sun-cured hay.

If silage is high in moisture, cattle may not be able to eat enough to supply their feed requirements (See Table 5). This may be a problem in wintering calves.

NOTE: Silage is satisfactory as a total ration for cattle except for mineral supplements. Bone meal or other mineral supplements should be fed with silage. (For recommended mineral mixtures see "Guide to Farm Practice in Saskatchewan.)

TABLE 5 — HAY TO SILAGE SUBSTITUTION

Crop	Moisture Content	Dry Matter	Lbs. Silage to replace 1 lb. hay
Hay	10%	90%	—
Silage	75%	25%	3.6
Silage	65%	35%	2.6
Silage	55%	45%	2.0

Young cattle feeding on silage with a high moisture content may not be able to eat enough to make satisfactory gains. For example, an 800 pound yearling requires about 18 pounds of hay per day or 36 pounds of silage at a moisture content of 55% or 65 pounds of silage at the 75% moisture level. An 800 pound yearling might not be able to consume 65 pounds of silage per day and therefore, under these circumstances, it may be necessary to reduce the silage and feed some dry hay.

RATIONS

Feed requirements of the various classes of cattle are taken from "The Nutrient Requirements for Beef Cattle" — N.R.C. publication 579. The following examples of rations were calculated for cereal grain silage with the following analysis:

Moisture	65%
D.C.P. (digestible crude protein)	2.0%
T.D.N. (total digestible nutrients)	20.1%

Class of Cattle	Daily Ration
Wintering Calves (500 lbs.) 1 lb./day gain	3 lbs. oats 26 lbs. silage
Wintering Yearlings (800 lbs.)	46 lbs. silage
Wintering Mature Beef Cows (1000 lbs.)	46 lbs. silage
Fattening Calves (400 lbs.) 2.3 lb./day gain	0.5 lbs. 32% protein supplement 6.0 lbs. barley 14.0 lbs. silage
Fattening Yearlings (600 lbs.) 2.4 lb./day gain	0.5 lbs. 32% protein supplement 9.0 lbs. barley 22.0 lbs. silage

METHODS OF FEEDING

HAND FEEDING

The size of herd and equipment available will determine how practical and economical it is to mechanize silage feeding. For herds of 50 - 75 head, the most economical method is to load the silage by hand and deliver it to the feed bunk by small truck or flat wagon. Where larger numbers are fed, it may be practical to use a tractor equipped with front-end loader to load the silage out of the silo. A manure spreader with the beaters taken off or a home-made unloading wagon can be used to unload the silage in the feeding area.

Where large quantities of silage are to be handled daily, a power feed box and a front-end loader for loading are a good investment.

SELF-FEEDING

Self-feeding is not generally recommended. Wintering beef cows will tend to consume more silage than they require. Another problem with a self-feeding arrangement is that of "clean housekeeping". Unless the silo is equipped with a concrete floor and frequently cleaned out, the manure will build up and a dirt bottom will become boggy. Self-feeding of feeder cattle and calves may be desirable if "clean housekeeping" can be practiced.

AUTOMATED FEEDING

Upright silos, automatic silo unloaders and auger systems make completely automated feeding of silage possible in large, specialized feeder or dairy operations.

TABLE 6 — PROBLEM CHART

Problem	Description	Cause	Remedy
Cold Silage	Insufficient rise in temperature during the first 24 hours.	Excessive packing. Excessive moisture.	Reduce packing, longer cut — do not pack until temperature starts to rise. Wilt in windrow.
Hot Silage	Temperature rising above 120°F.	Insufficient packing — crop too mature (dry).	Pack more, shorten cut, ensile crop at proper moisture content.
Burned Silage	Dark brown, charred appearance, tobacco odor — caramelized.	Excessive heat due to insufficient packing.	Pack more, shorten cut, ensile crop at proper moisture content.
Mouldy Silage	Mouldy appearance.	Air pockets, silo poorly sealed.	Spread while packing to avoid pockets. Pack more. Seal.
Rotten Silage	Black, slimy, rotten appearance.	Exposure to air and water.	Cover and seal silo with polyethylene sheeting.
Odor	Unpleasant, rancid, putrid, strong odors.	Cold silage; Excessive moisture.	Same as cold silage. Wilt crop before ensiling.

SUMMARY

To make good quality silage the operator must study and apply his knowledge of the many interrelated factors involved. Type of crop, stage of maturity, moisture content, length of cut, speed of ensiling, spreading, packing, temperature rise and covering must all be considered in the silage making operation. Care and good management will result in high quality feed having economic, labour and feeding advantages.

ACKNOWLEDGMENTS

The authors acknowledge the assistance and advice of the Federal Forage Crop Laboratory, Saskatoon; the Department of Animal Science and the Extension Division at the University of Saskatchewan and the authors of many publications — Canadian and foreign — that were reviewed in the preparation of this bulletin.

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July 1, 1964